



Integration in 15 sec.

$$\begin{aligned} d(\sin x) &= \cos x & d(\tan x) &= \sec^2 x \\ \Rightarrow d(\sec x) &= \sec x \cdot \tan x & d(\cos x) &= -\sin x \\ d(\cot x) &= -\operatorname{cosec}^2 x \\ d(\operatorname{cosec} x) &= -\operatorname{cosec} x \cdot \cot x \end{aligned}$$

$$\int \sin^m x \cdot \cos^n x dx$$

Bhaskar's rule

m	n	
① odd natural	x	$\rightarrow \cos x = t$
② x	$-$	$\rightarrow \sin x = t$
③ a	b	$\rightarrow a+b = m+n = -\text{neg. integer} \rightarrow \tan x = t$
④ even natural	even natural	\rightarrow plays with \cos

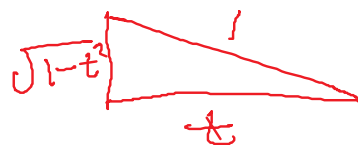
1. $\int \cos^5 x dx$ Normal method

$$\begin{aligned} \cos x dx &= dt \\ \sin x &= t \\ \Rightarrow \int (\sqrt{1-t^2})^4 dt &= \int (1-t^2)^2 dt \\ &= \int (1 - 2t^2 + t^4) dt \\ &= t - \frac{2t^3}{3} + \frac{t^5}{5} + C \\ &= \sin x - \frac{2\sin^3 x}{3} + \frac{\sin^5 x}{5} + C \end{aligned}$$

$$\begin{aligned} \int (\cos^4 x) \cos x dx &= \int (\cos^2 x)^2 \cos x dx \\ &= \int (1 - \sin^2 x)^2 \cos x dx \\ \text{Let } \sin x &= t \\ \cos x dx &= dt \\ &= \int (1 - t^2)^2 dt \\ &= \int (1 - 2t^2 + t^4) dt \\ &= t - \frac{2t^3}{3} + \frac{t^5}{5} + C \\ &= \sin x - \frac{2\sin^3 x}{3} + \frac{\sin^5 x}{5} + C \end{aligned}$$

② $-\int \sin^5 x dx$

$$\begin{aligned} -\sin x dx &= dt \\ \cos x &= t \\ -\int (\sqrt{1-t^2})^4 dt &= -\int (1-t^2)^2 dt \\ &= -\left(t - \frac{2t^3}{3} + \frac{t^5}{5} \right) + C \\ &= -\sin x + \frac{2\sin^3 x}{3} - \frac{\sin^5 x}{5} + C \end{aligned}$$



③ $\int \frac{1}{\sin^6 x} dx = \int \sin^{-6} x dx$

Put $\tan x = t \Rightarrow \sec^2 x dx = dt$

$\Rightarrow \int \frac{1 + t^2}{t^6} dt = \int \frac{1+t^2}{t^6} dt$

$\Rightarrow \int \frac{1}{t^6} dt + \int \frac{t^2}{t^6} dt = \int t^{-6} dt + \int t^{-4} dt$

$= \frac{t^{-5}}{-5} + \frac{t^{-3}}{-3} + C$

$= -\frac{1}{5t^5} - \frac{1}{3t^3} + C$

$= -\frac{1}{5 \tan^5 x} - \frac{1}{3 \tan^3 x} + C$

④ $\Rightarrow \int \sin^3 x \cdot \cos^{-1} x dx$ pending

⑤ $\int \cos^4 x dx$

$2 \cos^2 x = 1 + \cos 2x$

$\Rightarrow \int (\cos^2 x)^2 dx$

$= \int \left(\frac{1 + \cos 2x}{2} \right)^2 dx$

$= \frac{1}{4} \int (1 + \cos^2 2x + 2 \cos 2x) dx$

$= \frac{1}{4} \left(x + \sin 2x + \int \frac{1 + \cos 4x}{2} dx \right)$

$= \frac{1}{4} \left(x + \sin 2x + \frac{x}{2} + \frac{\sin 4x}{4} \right) + C$

$= \frac{3x}{8} + \frac{\sin 2x}{4} + \frac{\sin 4x}{16} + C$

H.W. ⑥ $\int (\sec^{4/3} x - \csc^{3/3} x) dx$

$\int \cos^n x dx$


$n I_n = (\sin x \cdot \cos^{n-1} x) + (n-1) I_{n-2}$

Red n formula

Agle video ke soln btunga

$$\int \frac{\sin^3 x}{\cos x} dx = \int \sin^2 x \cos^{-1} x dx$$

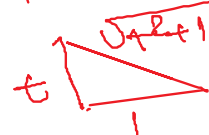
$\cos x = t$
 $-\sin x dx = dt$
 $= -\int (\sqrt{1-t^2})^2 \frac{1}{t} dt$



Now time to do hard sum which can't be solved by above method. So stay tuned if you like this video then please like, subscribe, share, comment down....

① $\int \sec^3 x dx = \int \sec x (\sec^2 x dx) = \int (\sqrt{t^2+1}) dt$

$\Rightarrow \int \cos^{-3} x dx$
 $\tan x = t$
 $\sec^2 x dx = dt$

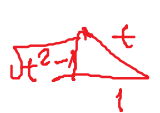



② $\int \tan^4 x dx$

$\Rightarrow \int \tan^2 x (\sec^2 x \tan x dx)$
 $\Rightarrow \int (\sqrt{t^2-1})^3 dt$
 $= \int \frac{(t^2-1)^2}{t^{\frac{2}{3}+3/2}} dt$

NOTE: here 3 will not apply

$\sec x = t$
 $\sec x \tan x dx = dt$


③ $\int \tan^3 x dx$

$= \int \frac{\tan^2 x}{\sec x} (\sec x \tan x dx)$

④ $\int \frac{\sin^3 x}{\sqrt{\cos x}} dx$

$\Rightarrow -\int \frac{\sin^2 x (-\sin x dx)}{\sqrt{\cos x}}$
 $= \int \frac{(1-t^4)^2}{2t} dt$

$\sqrt{\cos x} = t$
 $\cos x = t^2$
 $-\sin x dx = 2t dt$



$(1-t^4)^2 / 2t dt$
 $+ C$

$$\Rightarrow - \int \frac{(1-t^4)^{2t} dt}{t} = -2 \int (1-t^4)^{1/t} dt$$

$$= -2 \left(t - \frac{t^5}{5} \right) + C$$

$$t = \sqrt[5]{x}$$

~~Thank you~~



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